CLAIMS

1. A method, comprising:

determining an apex of a cone from a trajectory of a photon emitted from an object to a point of intersection on a first detector;

determining an axis of symmetry of the cone from the point of intersection on the first detector and a point of intersection on a second detector;

using a finite set of integrals dependent on the apex of the cone and the axis of symmetry of the cone to satisfy a completeness condition; and

using the finite set of integrals for image reconstruction.

2. The method of claim 1, the apex of the cone comprising the point of intersection on the first detector.

3. The method of claim 1, the axis of symmetry comprising determining a scatter angle of the photon from the first detector onto the second detector.

4. The method of claim 3, the scatter angle ranging from 0° to 180°.

5. The method of claim 3, further comprising determining a half-angle of a cone, the half-angle of the cone comprising the scatter angle of the photon.

6. The method of claim 1, the step of calculating providing Hilbert transforms on partial derivatives of a three-dimensional Radon transform.

7. The method of claim 1, the finite set of integrals of the cone comprising computing surface integrals of the cone.

8. The method of claim 1, the finite set of integrals of the cone comprising computing

integrated line integrals of the cone.

9. The method of claim 1, the image reconstruction comprising implementing a two-step reconstruction method.

10. The method of claim 1, the object comprising a human.

11. The method of claim 1, the object comprising an animal.

12. The method of claim 1, the object comprising a nuclear facility.

13. The method of claim 1, the object comprising a missile.

14. The method of claim 1, the object comprising a nuclear waste site.

15. A method for image reconstruction, comprising:
calculating a set of conical integrals to satisfy a completeness condition; and
relating the set of conical integrals to a distribution of radioactivity.

16. The method of claim 15, further comprising defining a cone from a trajectory of a photon from an object through a first detector and second detector.

17. The method of claim 16, the step of defining a cone comprising determining an apex, an axis of symmetry, and a half-angle of the cone.

18. The method of claim 15, the set of conical integrals comprising surface integrals.

19. The method of claim 15, the set of conical integrals comprising integrated line integrals.

20. The method of claim 15, further comprising calculating a Hilbert transforms on partial derivatives of a three-dimensional Radon transform.

21. The method of claim 15, the step of relating further comprising reconstructing an image.

22. The method of claim 21, the step of reconstructing comprising implementing a two-step reconstruction method.

23. The method of claim 21, the step of reconstruction comprising an ART-like or a SIRT-like reconstruction method.

24. The method of claim 21, the step of reconstruction comprising an ML-EM reconstruction method.

25. A method for image reconstruction, comprising:
calculating a set of integrated line integrals to satisfy a completeness condition; and
relating the set of integrated line integrals to a distribution of radioactivity.

26. A method for image reconstruction, comprising:
calculating a set of surface integrals to satisfy a completeness condition; and
relating the set of surface integrals to a distribution of radioactivity.

27. A computer readable medium comprising instructions for:
calculating a set of conical integrals to satisfy a completeness condition; and
relating the set of conical integrals to a distribution of radioactivity.

28. The computer readable medium of claim 27, further comprising instructions for determining an apex and an axis of symmetry of a cone.

29. The computer readable medium of claim 27, further comprising instructions for calculating Hilbert transforms on partial derivatives of a three-dimensional Radon transform of the cone on the set of conical integrals.

30. The computer readable medium of claim 27, the set of conical integrals comprising surface integrals.

31. The computer readable medium of claim 27, the set of conical integrals comprising integrated line integrals.

32. The computer readable medium of claim 27, further comprising instructions for implementing a two-step image reconstruction.

33. A system, comprising:

a Compton camera;

at least two detectors coupled to the camera, the at least two detectors configured to obtain conical data to satisfy a completeness condition

34. The system of claim 33, the camera being configured to move along a sine-on-cylinder curve.

35. The system of claim 33, the camera being configured to move along a circular path.

36. The system of claim 33, the at least two detectors comprising planar detectors.

37. The system of claim 33, the at least two detectors comprising a planar detector and a spherical-shaped detector.

38. The system of claim 33, the at least two detectors comprising a cylindrical detector and

a spherical-shaped detector.

39. The system of claim 33, the at least two detectors comprising a spherical-shaped detectors.